DOCUMENT RESUME

ED 153 313 95 EA 010 493

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TITLE The Effect of School Structure and School Culture on the Implementation of Planned Change.
INSTITUTION Abt Associates, Inc. Cambridge, Mass.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Mar 78
CONTRACT OEC-0-72-5245
NOTE 39p.; Paper presented at the Annual Meeting of the American Educational Research Association (Toronto, Ontario, March 27-31, 1978)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Adoption (Ideas); *Educational Change; *Educational Environment; *Educational Innovation; Multiple Regression Analysis; *Organization; Organizational Change; Rural Schools; Tables (Data); Teacher Attitudes; Teacher Morale

ABSTRACT

This paper investigates the impact of school structure and culture on the implementation of planned change. In addition to simply locating effective predictors of implementation, an attempt is made to examine the relative impact of variables associated with two theoretical perspectives--social psychology (school culture) and sociological (school structure)--and to synthesize the two. The structure and culture variables have unique contributions to make to the understanding of change outcomes, although they are differentially effective in predicting two dimensions of change: quality ("how different") and quantity ("how much"). In addition, there are interactions between the structure and culture variables that have a significant impact on the change process. It is impossible to develop an adequate theory of planned change in schools without paying attention to both significant structure features of the organization, such as pattern of authority, size, and teaching technology, and to characteristics of the internal organizational environment, such collegiality, morale, and tension or conflict. The finding that quality of change and quantity of change are best predicted by different sets of variables adds testimony to the need to develop a more sophisticated conceptualization of the outcomes of the change process. (Author/IRT)

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THE EFFECT OF SCHOOL STRUCTURE AND SCHOOL CULTURE ON THE IMPLEMENTATION OF PLANNED CHANGE

by

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Presented at Annual Meeting of the American Educational Research Association in Toronto, Ontario, March 28, 1978

This paper is based on research conducted at Abt Associates, Inc. under Contract No. OEC-0-72-5245 to the National Institute of Education.

EA 010 493

Introduction

The prevailing climate in educational settings favors innovation over maintaining the status quo (Baldridge and Deal, 1975). It is widely accepted that the process of change is conditioned by the organizational setting and its environment (Herriott and Hodkins, 1973; Hage and Aiken, 1970; Zaltman et al., 1973), and much of the growing literature on the implementation of planned innovation has focused on the organizational characteristics that facilitate (or hinder) implementation (Deal et al., 1975; Gross et al., 1971; Berman & McLaughlin, 1975). Given the failure of many attempts to implement change, it is extremely important to further an understanding of the crucial organizational properties and processes involved in implementing innovations. This is a prerequisite to a full understanding of the strategies that can be used to facilitate and support educational changes.

Much can be learned about the organizational properties of schools by looking to the social sciences for theories of organizational behavior and organizational change. Within the social sciences there are two divergent approaches to both the attempt to change an organization and the explanation of its outcomes. The first is derived from a social psychological perspective, and emphasizes the manipulation of the internal environment of the organization, or its "culture" (Argyris, 1972; Bennis, 1966; Sarason, 1972). The second tradition derives from a more sociological perspective and focuses on the Weberian approach to organizations and their "structure" (Blau, 1972; Pugh et al., 1963). Although schools as organizations are also influenced by their external environment we have chosen in this paper to particularly examine their internal characteristics -- their structure (formal properties) and culture (shared values and attitudes representing the informal

properties of the internal environment of the organization). We believe these properties to be most crucial to the implementation process and their importance is amplified as they are the most directly manipulable elements of the organization.

The basic theoretical problem with these two divergent approaches cited above is that empirical studies tend to use predominantly either the structure (Deal et al., 1975; Baldridge and Burnham, 1975; Carlson, 1965) or culture variables (Clark, 1972; Bowers, 1972; Bennis, 1966) or, if both kinds of variables are used (Berman and McLaughlin, 1975; Hage and Aiken, 1971), one tends to be measured with greater precision and care than the other. However, since structure and culture may be interrelated in an organization, it is almost impossible to create lasting change in one without modification of the other. Yet, there are those who focus on changing structures with no involvement in the culture in which those structures are embedded (Blau, 1972), and those who are concerned with changing cultures, oblivious of the ongoing structure (Argyris, 1972).

For example, the cultural approach to organizational change emphasizes the fact that organizations are composed first and foremost of people (Likert, 1969). Organizations do not, in and of themselves, behave. In order to change the organization, one must first change the ways in which people view their behavior, or the ways in which they relate to one another (Bennis, 1966; Alderfer, 1971; Pritchard and Karasick, 1973). If and when significant groups of people within the organization have orientations that support change programs and which are consistent with the objectives of the change programs, then change will (or can) take place (Katz and Kahn, 1966; Schein, 1969). Few proponents of this approach believe that structural variables are of total insignificance (indeed, many of the field experiments

within the human relations tradition manipulate some structural aspects of the organization), but the general emphasis is upon the informal organization and its impact on change.

Those falling into the structural tradition, on the other hand (Pennings, 1976; Perrow, 1972) tend to view culture variables as outcomes of structural arrangements. Basically, the structure of the organization -- its complexity, formalization, authority structure and so forth -- are seen as constraints on individual behavior (Blau and Schoenherr, 1971; Klatsky, 1970; Hall et al., 1967). In its extreme forms, the structural approach is like an analog of behaviorist therapy for individuals: it assumes that if the structure is changed, then changes in the informal organization will be a natural result. Since they assume that the same individual will behave in different ways within different structural arrangements, the proponents of this approach prefer to focus on structure rather than on the more informal orientations of individuals (Woodward, 1965). Similarly, in looking for explanations of naturally occuring change, structuralists tend to assume that their preferred variables will provide the most comprehensive and complete theories, to which cultural variables will contribute insignificantly.

A contingency approach to organizational theory resulted from the conflicting findings of many of these empirical studies. Contingency theory maintains that relationships among any given organizational variables depend upon the strength of many other variables (Friedlander and Brown, 1974; Perrow, 1972).

Indeed, the complexity of organizational systems suggests the need to be more inclusive as to the variables measured and to be sensitive to the moderating effects of the various "parts" of the organizational 'whole."

Because we hope to develop an improved understanding of change in schools, we chose to look at the relative importance of structure and culture and at the interaction between them as they contribute to an understanding of change, and to pursue an apporach which begins to weld together elements of both traditions. For this purpose, we present the results of exploratory analysis addressing the following questions:

1) What are the unique and joint contributions of variables representing the structure and culture of schools in explaining variations in implementation of innovation?
2) Do interactions between structure and culture variables make significant additional contributions to the explanation of implementation of innovations in schools?

The Setting

The data used in this analysis were collected from 45 schools located in ten rural school districts. The ten districts are participants in the Experimental Schools (ES) Program funded by the National Institute of Education (NIE). Under the auspices of NIE, these small school districts (eight of which had six schools or fewer) undertook the planning and implementation of "comprehensive" district-wide change. Comprehensiveness was defined by NIE as affecting five facets of the educational system: curriculum, staff, community participation, administration and governance, and the use of time, space and facilities. While each district's project was developed at the local level, it was required to reflect the federally-defined objective of comprehensiveness. Many of the activities aimed at individualizing instruction, curriculum revision, and increased exposure to career opportunities, the environment and the arts.

The school districts themselves represent a wide geographical and organizational spectrum of rural schools. Situated in diverse parts of the country from New England to Alaska, some schools were located on centralized campuses, while others were in recently consolidated districts which maintained small schools at considerable distances from one another.

The data used in this paper are part of a large research effort which is an integral part of the Experimental Schools Program. One part of that effort, the Organizational Change Study, has been systematically gathering data on the stages of the planned change program within districts and schools, and on organizational characteristics that may affect or be affected by such change programs (Herriott and Rosenblum, 1976; Rosenblum and Louis, 1977). Data have been collected both through surveys of the school personnel involved in the program, and through a professional field worker who resided in each of the districts for three years during the implementation phase.

The Variables and their Measures

Independent Variables

The independent variables in this study are attempts to measure:

- the structure of the schools, which includes variables defining the formal properties of the organization and its decision-making system; and
- the culture of the schools, which includes variables defining the informal values and norms that pervade the organization. These variables are sometimes defined as organizational "climate," or the internal environment of the organization.

In the fall of 1973, at the end of the project's planning year, all teachers in the district were administered a mailed questionnaire which covered a wide variety of issues regarding the operations of their school and distirct. The overall response rate to this questionnaire was 72%. Since the purpose of this study was to look at the behavior of schools as organizations rather than at that of individual teachers, teacher responses within school were averaged to obtain a school score for each variable. Thus the variables represent the structure and culture as perceived by those teachers responding in each school.

Structure Variables

The structure variables were selected on the basis of a growing consensus concerning the crucial dimensions of the formal organization. (See, for example, Pugh et al., 1968; Blau and Schoenherr, 1971; Hage and Aiken, 1971) The structure variables include complexity, size, formalization, technological differentiation, classroom autonomy and a variety of variables that deal with the power structure of the school. Another structural variable unique to schools is that of school level (elementary versus secondary). With the exception of size and level, each of these variables was scaled from multiple items on the questionnaire. The variables, their operational definitions, and Chronbach's Alpha coefficient of internal reliability are presented in Figure 1. (Each variable met the minimum criterion we had established prior to conducting the analysis - Chronbach's Alpha of at least .65).

Figure 1

School Structure Variables

Variable	Operational Definition/ Measures Used	Chronbach's Alpha Coefficient of Interal Reliability
Complexity*	# of specialists in the school # of administrators in the school # of different occupational specialties in the school	-----
School Size	# of pupils**	-----
Formalization	# of formal policies that are regularly enforced	.77
Individualized Instruction	Use of individualized instruction	.82
School Level	Dummy variable representing either elementary or secondary school	-----
Classroom Autonomy	# of classroom decisions that the teacher can make on his or her own	.72
Structuring of Authority	Level of school board influence Level of superintendent influence Level of principal influence Level of teacher influence	.82 .85 .84 .75

* The complexity measures were so highly interrelated (minimum correlation of .75) that a single index was computed by standardizing and adding the three separate scores. No reliability coefficient was computed because of small number of items in the scale.

**The number of full time equivalent (FTE) professional employees in the school was also measured, but was so highly correlated with the number of pupils (over .90) that the single pupil measure was used. No reliability coefficient for this single measure item.

Culture Variables

While organizational researchers generally agree that the informal organization will affect the change process in at least some ways, most research on the impact of the informal organization on change has been in the form of qualitative case studies rather than quantitative studies using large samples of organization. As a result, the literature offers more limited guidance for variable definition.*

In general, the literature is in agreement that two sets of culture or climate variables are extremely important in determining organizational process. These are the morale of the staff and the cohesiveness of staff as a work group. Since there are no "work groups" as such in schools, we have redefined the latter variable as the level of collegiality among the staff. However, other variables also seemed important in defining the normative

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*Some exceptions to this generalization should be noted. Bowers' (1973) study of the organizational change techniques in a number of organizations used the Survey of Organizations instrument developed at the Institute for Social Research. The survey is rich in variables measuring organizational climate. However, the fact that the data were obtained from manufacturing organizations rather than schools limits the utility of the results for educators and educational researchers (Bowers, 1973, pp. 21-43). The Rand Change Agent study (Berman and McLaughlin, 1975) included a number of variables subsumed under the general heading of "Organizational Climate" which correspond to our notions of culture, but these do not reflect all of the factors that we have chosen to measure.

character of the schools. The list that was finally developed represents a potpourri of factors that we believed to be important in schools. These were selected on the basis of available theoretical discussions, case studies and quantitative studies, not all of which were directly concerned with change. Among these are the level of tension between various groups, the actual disputes that occurred over school-related issues, the orientation toward change of the staff as a whole, the orientation to pupil autonomy in the educational process, the staff's perception of problems within their school, and the degree to which the staff perceived a discrepancy between their goals and the achievement of goals. All of these items were scaled from multiple items on the questionnaire. The variables, their operational definitions and Chronbach's Alpha coefficient of internal reliability are presented in Figure 2.

Dependent Variables

The dependent variable, the "scope of implementation," was designed to measure the degree to which the school had implemented comprehensive changes by the end of the fourth year of the program. An important characteristic of the scope of implementation score is that it takes into account the fact that innovations in organizations do not all have the same characteristics. Some affect large numbers of people in relatively small ways, while others may have an enormous impact upon a relatively few number of people. Because change is not a unidimensional variable, an attempt was made to develop a differentiated approach to two basic questions about change: "how much" (the quantity of change) and "how different" (the quality of change).

Data regarding the scope of implementation of change were collected through a structured questionnaire that was completed by a professional

Figure 2

School Culture Variables

Variable	Operational Definition	Chronbach's Alpha Coefficient of Internal Reliability
Tension Index	# of role pairs that have at least "some" tension	.82
Disputes Index	# of issues that cause frequent disputes between various groups	.87
Morale	Discrepancy between actual and desired level of personal influence	.86
Change Orientation	Additive score on 6 change attitude items	.71
Orientation to Pupil Autonomy Index	Additive score on 7 pupil autonomy attitude items	.77
Collegiality Index	Additive score on 6 collegiality items	.69
Perception of Problems Index	# of areas perceived as moderate or serious problems in the school	.71
Goal Differentiation	# of goals considered to be "very important"	.74
Goal Discrepancy Index	The sum of the difference between the importance of goals and how well they are being accomplished (12 goals)	.77

anthropologist or sociologist employed by Abt Associates to reside at each site. District and school administrators were consulted in the process of filling out the forms in order to ensure that the data reflected school personnel's judgments about the levels of implementation as well.*

Three measures were computed representing the quantity, quality and the total scope of implementation.** The dependent variables, their operational definitions and Chronbach's Alpha coefficient of internal reliability are presented in Figure 3.

Most studies of change suffer from the major problem of relying on cross-sectional data. When the data measuring organizational or system characteristics are collected at the same point in time as the data on change, there is always the possiblity that findings are a result of the ways in which the system has adapted to the new program rather than a reflection of the ways in which system characteristics are affecting it. In this study of organizational change, however, the school characteristics were measured in the fall of 1973, during the early stage of the ES program, while the data on implementation of the ES projects in the schools were gathered in the spring of 1976, almost three full school years later. As with any correlation analysis, we must use caution in attributing causality to our results. However, where theory is supportive of a causal interpretation, we may proceed with somewhat greater confidence than in a study with a cross-sectional design.

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*Very few discrepancies between the field workers and administrators were reported, and those discrepancies were relatively minor. Where a discrepancy in judgments arose, the judgments of the field worker were used after discussions about the nature of the discrepancy. In all cases discrepancy consisted of administrators rating the level of change on a given question slightly higher than did the field worker. The discrepancy in almost all cases consisted of a one-point separation on a six-point scale. A more detailed discussion of these measures may be found in Rosenblum and Louis (1977).

** Total Scope is the sum of quantity and quality.

Figure 3

Scope of Implementation Variables

Variable	Operational Definition	Chronbach's Alpha Coefficient of Internal Reliability
Quantity	Sum of: % of students involved % of teachers involved average involvement of students (% of school day) average involvement of teachers (% of school day)	.60
Quality	Sum of five indicators reflecting degree of change (scaled 0-5 each) in -use of time, space and facilities -level of community involvement -administration and governance -curriculum -school structure	.76
Total Scope	Sum of quality and quantity normed to 100	.76

Regressions of Implementation Scores on School Structure and Culture Variables

In order to determine the relative importance of individual structure and culture variables in explaining implementation of planned change, we first conducted separate stepwise multiple regressions of the dependant variables on each of the two independant groups.

Structure Variables

The standardized regression coefficients for those structure variables that contributed at least 2 percent to the explained variance of the total implementation score and the dimensions of quality and quantity are presented in Table 1.

The structure variables as a group are able to predict a large percentage of the variance in each of the three dependent variables. The percentage of explained variance ranges from .50 in the case of quality of change, to .33 in the case of quantity of change. Even when the adjusted multiple R^2 are examined, we find that with four or five structure variables we are able to explain at least one quarter of the variance in our measures of implementation.

Two structure variables stand out among the other nine as having consistently significant relationships with both the total implementation score and the two dimensions of quality and quantity: the level of the superintendant's authority in decisions making, and the size of the school are both positively related to implementation. While the finding that size is related to innovation in organizations is far from novel (cf. Kimberly, 1976), the role of the strong superintendent is somewhat more surprising. This is particularly the case since neither principal authority nor teacher authority variables enter the

TABLE 1

Standardized Regression (Beta) Coefficients for the Relationship Between 10 School Structure Variables and Each of the Three Measures of Scope of Implementation[+] (N = 45)

School Structure Variables	Total Scope	Quality	Quantity
Classroom Autonomy	-.16 (2)	-.25* (4)	
Complexity	-.22 (5)		-.26 (4)
Formalization			
Individualization Technology	.29* (4)	.22 (5)	.37* (2)
School Level Secondary School		.34* (3)	
School Size	.41* (3)	.28* (2)	.40* (3)
School Board Authority			
Superintendent Authority	.39* (1)	.48* (1)	.31* (1)
Principal Authority			
Teacher Authority			
Multiple R^2	.43	.50	.33
Adjusted Multiple R^2	.36	.43	.27

[+]Beta Coefficients are presented only for those variables that increased the Multiple R^2 by 2% or more. Statistics are based on the stepwise regression including only these variables. The sequence of variable entry was unforced. (Order of entry in parentheses)

*Non-standardized regression coefficient is at least twice the standard error.

equation at all. Many theorists of planned change argue that organizational innovation is facilitated by decentralized authority structures (Bennis, 1966; Zaltman et al., 1973). Our data, however, indicate that for comprehensive change of the type envisioned by the designers of the ES program, not only does decentralization not facilitate implementation of change in any significant way, but that giving teachers significant decision-making power within the classroom (classroom autonomy) may actually inhibit organization-wide innovations. (For a more extensive discussion of the impact of centralization and participation on change, see Louis and Rosenblum, 1977).

Another variable which appears to be important in explaining implementation is the presence of individualized teaching technologies. Where the school has had experience in using teaching methods which involve differentiated activities within the classroom, the implementation of new curricular and structural innovations (many of which, within the programs designed by the ten districts, involved a greater emphasis on individualized instruction) becomes easier. In this case, the importance of individualized methods may rest, in part, upon the fact that the school has already adopted more contemporary approaches to classroom instruction.

In many studies of organizational change, complexity is found to be positively associated with innovation. Our data indicate, however, that for schools, complexity is not among the most significant predictors of implementation and, furthermore, it tends to be negatively related to change. This finding should not, however, be viewed as an anomaly in organizational research, for several other studies have found either insignificant or negative relationships between complexity and change (Hage and Aiken, 1967, Louis, 1977). The inconsistency of results between studies indicates that the concept of complexity may require additional theoretical and empirical

specification. One possible interpretation of the negative finding in this case is that specialists at the school level may tend to generate their own programmatic priorities which are not always consistant with the objectives of a district-wide change program.

It is interesting to note that within our sample, the variable indicating whether a school is a primary or secondary school is significant in only one of the three equations. The folklore of education often assumes that primary schools are considerably more innovative than secondary schools, in part because of their simpler organizational structure, and in part because of their greater emphasis on teaching techniques as compared to specialized subject matter. Recent studies have corroborated this assumption (Berman and Pauly, 1975). Our data, however, suggest that secondary schools are more likely to implement programs which are significantly different from previous programs (quality of change) than are elementary schools. Based on our knowledge of the content of the innovations within the ten districts, we believe this finding may be explained quite simply: elementary schools were more likely to be involved with innovations which <u>modified</u> existing core curricula, such as reading or other basic skills. Secondary schools, on the other hand, were generally involved in implementing <u>totally new</u> programs or courses which were distinct from the previous educational offerings: new career counselors, specialized vocational offerings, new or novel uses of media centers, and so forth. Preliminary findings indicate that, while these non-core innovations were, in fact, more "different", they were also more likely to become dramatically altered or even eliminated after the funding period was over.

A tentative image of the innovative rural school may be drawn from the findings presented in Table 1. Such a school is a relatively large one,

which is the case of the rural districts being studies generally means over 200 students. Despite its size, it has a relatively undifferentiated administrative structure, and few specialists attached to the school itself. The superintendant, on the one hand, has a great deal of influence in this school, and exercises strong leadership in program management. The teachers, on the other hand, have relatively little autonomy, which suggests that the "professionally oriented" school with an active staff that participates in curricular decisions may not be the most open to district-wide educational change.

Culture Variables

School culture variables as a group also appear to have a strong impact upon implementation (Table 2). The percentage of the variance explained by school culture is somewhat less than that explained by the structure variables at the school or district level. The adjusted multiple R^2s still range, however, from .22 for quality to .34 for the total scope score. In addition, this regression promises to help us eliminate variables that are less useful for understanding the implementation of planned change.

Several culture variables stand out among the others as entering into all of the regression equations, and producing relatively high beta coefficients for each of the dependent variables. These are collegiality, morale, existance of perceived problems, and level of tensions (for quality) or disputes (total scope and quality). On the one hand, schools characterized by high tensions or disputes and high dissatisfaction among teachers with their individual influence on educational decisions (low morale) seem to be those schools which implement ES changes at a greater level. On the other hand, high implementing schools are characterized by high collegiality.

TABLE 2

Standardized Regression (Beta) Coefficients for the Relationship Between 8 School Culture Variables and Each of the Three Measures of Scope of Implementation+
(N = 45)

School Culture Variables	Total Scope	Quality	Quantity
Change Orientation			
Collegiality	.83* (1)	.43* (2)	.80* (1)
Goal Discrepancy			
Level of Tension			.20 (2)
Frequency of Overt Disputes	.24 (5)	.25 (3)	
Morale	-.39* (2)	-.38* (1)	-.27* (3)
Pupil Autonomy Orientation	.19 (4)		.20 (5)
Problems Index	.31 (3)	.19 (4)	.28 (4)
Multiple R^2	.42	.29	.40
Adjusted Multiple R^2	.34	.22	.33

+Beta coefficients are presented only for those variables that increased the Multiple R^2 by 2% or more. Statistics are based on the stepwise regression including these variables. The sequence of variable entry was unforced. (Order of entry in parentheses.)

*Non-standardized regression coefficient is at least twice the standard error.

These findings lend support for two general approaches to change that are often viewed as contradictory in the literature. Conflict theories of change emphasize the need for unrest in the system at both the level of the individual, and of groups interacting together (Coser, 1956). Functional theories of change tend to stress cohesiveness and cooperation among groups as a prerequisite for smooth, non-revolutionary change (Parsons, 1951). Our preliminary investigations suggest that variables derived from both theories need to be present in order to maximize the smooth implementation of new programmatic efforts in schools. While further elaboration of this finding is clearly in order, it may be that it is the interaction between organizational and personal dissatisfactions, and cohesiveness of staff members that facilitates change.

A caveat should be added to explain our finding that morale is negatively related to implementation of change. Morale is poorly articulated concept in most organizational research, and is, therefore, frequently measured in radically different ways. Perhaps the most common way of measuring morale is through attitudinal items asking about job satisfaction. Our measure of morale, however, revolved around the notion of satisfaction with the level of influence that the respondant felt that they could exercise over their working environment, a measure which may be independent of overall job satisfaction.

One important "non finding" of this table should be noted. The index of change orientation within the school failed to enter any of the regression equations given our criteria. Even when the less stringent test of contributing one percent to the explained variation was applied, the change orientation index entered only the regression using quality of change

as the dependent variable. This finding stands as a cautionary note to the researcher or practitioner who may assume that progressive attitudes among organizational staff members will necessarily enhance change programs. Qualitative data available from the larger study of the Experimental Schools programs are peppered with instances where teachers who perceived themselves to be innovative resented any attempt to tell them how to change their own teaching procedures (Herriott and Gross, forthcoming). Where the innovation is compatible with the orientations of the innovative staff it may be easily accepted. Where it is not, however, the innovative staff may be more likely to reject it outright than the non-innovative staff.

Summarizing the Results of the Initial Regressions

Our initial regression analyses raise a number of important issues. First, we find that a number of the variables in both the structure and culture categories are highly related to each of the two dimensions and to total scope of implementation. Second, we find that both sets of variables result in relatively high multiple R^2s. In other words, they seem to explain a relatively large percentage of the variance in each of the dimensions, and in the total scope score.

The percentage of the variance explained by each group of variables, when coupled with our knowledge that there are at least modest correlations among many of the independent variables, lead inevitably to an exploratory question: How much of the multiple correlation between structure and culture variables reflects unique contributions of one or the other, versus the overlap between structure and culture? This question is extremely important in exploring a theory of planned change in schools, for it will serve as a guide to developing additional research questions.

For example, if structure and culture variables contribute uniquely to the dependent variables, we will be led to explore interactions within each of these sets, while if there are evidences of high commonalities, or interaction effects, we must engage in further exploratory analyses to determine the nature of those interactions.

Comparing the Contributions of Structure and Culture Variables to School Change

Our general approach to this problem has been to analyze the commonality of the school structure and school culture variables as they relate to the three dependent variables. The commonality was computed as follows:

$$S_u = T - C$$

$$C_u = T - S$$

$$SC = (C + S) - T$$

where S and C are the unique contributions of structure and culture variables in their respective regressions, SC is the common contribution, and T is the total variance explained by both sets. Only structure and culture variables that met the criterion of contributing at least 2% to the multiple R^2 were used in the regressions. The results may be seen in Table 3.

Turning to the "bottom lines" first, the table indicates that between 47% and 61% of the variance in the implementation scores can be explained on the basis of intra-organizational variables alone. The size of the multiple R^2s is much higher than is generally found in studies that attempt to predict implementation of change in organizations on the basis of similar variables. Baldridge and Burnham (1975), for example, are able to predict about 32% using both intra-organizational variables and an additional cluster of variables reflecting the environment of the school. Using both district- and school-level variables, Deal et al (1975) explained only 23% of the variance in

TABLE 3

Proportion of Variance in the Scope of Implementation Scores Explained by Structure and Culture Variables *
(N = 45)

School Variables	Total Scope	Quality	Quantity
Structure Variables	.19 (.15)	.18 (.14)	.16 (.13)
Culture Variables	.17 (.13)	.07 (.01)	.24 (.19)
Joint Contribution of Culture and Structure	.25 (.21)	.22 (.21)	.17 (.14)
Total Multiple R^2	.61	.47	.57
Total Adjusted Multiple R^2	(.49)	(.36)	(.46)

* Numbers in parentheses are based on the adjusted multiple R^2

school adoptions of team teaching and differentiated reading instruction.* Because our multiple R^2s are so much higher than these, it is worth commenting on some possible reasons for the difference.

First, the high levels of association found represent an initial validation of the scope of implementation construct. The research was initiated with the premise that developing a better understanding of change required knowing in some detail what that change was. By differentiating the concept and operationalizing several distinct measures of change, we may have reduced measurement error and increased our ability to find important relationships.

Second, we must also note that we are looking at the implementation of particular locally planned changes that were designed and put into practice within a district. Many other researchers have been concerned either with the adoption of one or two innovative programs that are being diffused throughout the United States or with more general "program change." (See Downs and Mohr, 1976 for a critique of the approach to measure innovation.) The greater specificity of our dependent measure results, in large part, from the nature of the Rural ES program.

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*Hage and Aiken (1967) were able to explain 55% of the variance in "number of program changes." However, their results should be interpreted with some caution since they had only 16 cases, and entered seven variables into the regression analysis. This points up the problem of "shrinkage" in the R^2 when degrees of freedom are used up by entering variables. We have discussed the unadjusted R^2, following existing conventions in the sociological literature. However, the adjusted R^2 in Table indicate that "shrinkage" due to diminishing degrees of freedom is not a major problem, as the adjusted R^2s are still higher than those generally found in the literature.

Table 3 provides support for the assumption that we need to build conceptual bridges between the cultural and structural approaches to change. Looking at the unique explanation of the variance in rows 1 and 2, we find that both structure and culture make a unique contribution to our attempt to explain variation in each of the dependent variables. The relative contribution of each set to the explanation of the total scope score is roughly equivalent. However, for the dimensions of quality and quantity one of the two sets appears to predominate. In the case of quality, the school structure variables uniquely account for 18% of the dependent measure, while culture variables account for only 7%. In the case of quantity, on the other hand, culture variables account for 24% and structure variables account for 16%. This finding is extremely important, for it suggests why both types of variables may be of theoretical and practical significance.

Unless there is a supportive school culture, planned innovations may be isolated in a limited number of classrooms, or involve a very small percentage of the normal school day. The innovations will not necessarily disappear, but they will be confined to those individual teachers who are willing to use them, or will be minimized in terms of their impact upon the total teaching environment. Given the centralized nature of the planned change activity being studied (district wide planning and implementation of new programs) isolation of the innovation is one of the techniques that less innovative schools may use to deal with the demand to implement change, while, in fact, allowing it to have only minimal impact upon organizational operation.

In the case of the quality of the innovation, or the degree to which it represents a genuine change of activities, structural features, such as cen-

tralized district leadership, low levels of classroom automony, and the presence of individualized teaching technologies may be required as a prerequisite to the designing of programs that depart significantly from existing practices. For example, in a school where teacher control over the classroom is high, it may be difficult to actually introduce an innovation that will be implemented in a similar fashion across classrooms, thus producing a school-wide program that is different. Such a structure may produce so much individual adaptation at the classroom level that observing the innovation as a different and unique activity across classrooms may be impossible. Similarly, small schools may simply not have the staff resources to effectively implement a program that is very different from existing practices, even when they are provided with new materials and occasional training support, as was generally the case for the projects being studied.

Equally important to the finding that culture and structure tend to contribute differentially to the explanation of the quality and quantity of change is a final finding that emerges from Table 3. In all three regression equations, the joint contribution of the two variable sets is high, ranging from .17 in the case of quantity, to .25 in the case of the total scope score. In the case of the total scope score, and the quality of change dimension, the joint contribution represents well over 1/3 of the explained variance. This finding suggests, as noted above, that in order to advance our understanding of change, we must explore the ways in which structure and culture variables interact in their relationships to the implementation of change.

Interactions Between Structure and Culture Variables and the Implementation of Planned Change

Conditional relationships between independent variables in the behavioral sciences have frequently been found to be critical in predicting a dependent variable. For example, it is now taken almost for granted that sex and race interact with one another in their impact upon achievement motivation (Horner and Walsh, 1974) and that there are aptitude-treatment interactions in the educational process (Bracht, 1970). Studies of organizational behavior, on the other hand, have only rarely attempted to look for systematic interaction effects (e.g., Herriott & Hodgkins, 1973), although the development of contingency approaches to management theory has stimulated some development in this analytic area (see, for example, Bons and Fiedler, 1976; Fiedler, 1972).

While the findings presented in Table 3 suggest that it may be fruitful to examine interaction effects within the structure and culture variable groups as well as between them, this paper will limit its examination to structure-culture interactions. In order to locate significant interactions, a number of steps were taken.

First, it was decided to limit the examination of structure-culture interactions to those variables that appeared to have consistently strong predictive relationships with the total scope of implementation, and the dimensions of quality and quantity. Four structure variables (superintendent authority, classroom autonomy, size and individualized technology) and four culture variables (collegiality, morale, problems index and tension) were selected.*

*The selection was made on the following basis: using the three dependent variables, 9 regressions were computed. Three involved entering all structure and culture variables stepwise, 3 only structure variables, and 3 only culture variables. Structure and culture variables that contributed at least 2% to the explained variance in at least three of the six regressions where they were included were classified as having consistantly strong predictive power.

Interaction terms were then computed by multiplying the score for each structure variable by each culture variable, which produced 16 interaction terms. Finally, separate stepwise multiple regressions were conducted for total scope, quality and quantity. The main structure and culture terms were entered on the first step, and the interaction terms were allowed to enter naturally on the remaining steps. The results of these regressions are presented in Table 4.

It was anticipated that, due to the limited degrees of freedom available after the entry of the main terms, and the relatively large multiple R^2 associated with the main terms, that interaction variables would have only a slight effect upon the adjusted multiple R^2. However, the regression results indicate that the addition of interaction terms to the equations has a strong impact upon the explanation of implementation.*

For each of the three dependent variables, three separate interaction terms emerge as significant.

One of the interesting features of Table 4 is that, like previous tables, it reveals that interaction variables behave differently in the separate regression equations for quality and quantity. In the case of quality, the significant interaction terms are those involving size/tension, size/collegiality and individualized technology/morale. For quantity, on the other hand, significant interactions are found between classroom automony/collegiality,

*It is important to emphasize that the adjusted multiple R^2 continued to increase through each step of the regression rather than declining, as it would if the "shrinkage" due to lost degrees of freedom outweighed the increased fit obtained through the addition of new variables. While the number of variables entered is large compared to the degrees of freedom, this result allows us to be confident that we are not, in fact, "overpredicting" the equation. Because of the large number of variables used in these equations, we present only the adjusted R^2 in Table 4.

TABLE 4

Stepwise Regression Coefficients for
Main Terms and Interaction Terms+
(N = 45)

School Structure Variables	Total Scope	Quality	Quantity
Main Terms - Structure			
Superintendent authority	-1.46	-1.76	.23
Classroom autonomy	.04	2.66	4.82*
Size	-7.14*	-5.64*	.37*
Individualized technology	1.16*	1.17*	1.46*
Main Terms - Culture			
Collegiality	-1.31	1.53	4.67*
Morale	-.90*	-1.18*	-4.89*
Problems index	.41*	.30*	.39*
Tension	.96*	-1.16*	1.35
Interaction Terms			
Size/tension	1.99*	1.91*	
Size/collegiality	5.91*	4.42*	
Individualization/morale	-1.09*	-1.30*	
Superintendent authority/ collegiality	2.22	2.69	
Autonomy/collegiality		-4.58	-6.01*
Autonomy/morale			-4.54*
Individualization/tension			-1.45*
Adjusted Multiple R^2 - Main Terms	.50	.36	.47
Adjusted Multiple R^2 - Main Term and interim terms	.68	.55	.58

+Coefficients are presented only for interactive terms that increased the multiple R^2 by 2% or more.

*Regression coefficient is at least twice its standard error.

classroom autonomy/morale, and individualization/tension.

Discussion of Interaction Terms

While the regressions are useful in determining whether interaction terms can significantly improve our ability to predict implementation of innovations in schools, the regression coefficients themselves do not reveal in what way the variables are interacting in their relationship with the dependent variables. In order to examine the interaction terms further and to interpret them, each of the variables included in an interaction term was dichotomized at the median, and the means in each of the cells resulting from the pairing of dichotomized variables were examined. The results of this decomposition are presented in Tables 5, 5a and 5b. We present our interpretations of three of these terms that showed interaction effects for one of more of the dependent variables.

Size/tension: For this interaction the data suggest that the presence of tension in a school may either facilitate or impede planned change, depending upon the size of the school. Small schools characterized by high levels of tension between role partners are significantly less likely to be high implementers than large schools, while large schools with high levels of tension are significantly more likely to be high implementers. This finding suggests that the question of whether tension is "healthy" may be resolved, in part by examining the context in which tension occurs. Tension within small work groups, which are often characterized by highly affective relationships among staff members, appears to have negative consequences for the organization's ability to adapt. In working environments which are more bureaucratic, and probably less effective, tension may serve as a stimulus and an incentive to change.

Table 5

Mean Total Scores

for Dichotomized Interaction Terms

(N = 45)

SIZE

TENSION	High	Low
High	108.5 (12)*	64.8 (11)
Low	90.7 (11)	85.4 (11)

SIZE

COLLEGIALITY	High	Low
High	116.7 (10)	82.6 (13)
Low	87.1 (13)	64.2 (9)

INDIVIDUALIZATION

MORALE	High	Low
High	95.6 (14)	89.9 (8)
Low	95.4 (9)	78.9 (14)

SUPERINTENDENT AUTHORITY

COLLEGIALITY	High	Low
High	107.7 (16)	74.0 (7)
Low	77.1 (7)	78.0 (15)

*The N in each cell is in parenthesis.

Table 5a

Mean Quality of Change Scores
for Dichotomized Interaction Terms
(N = 45)

		SIZE	
		High	Low
TENSION	High	43.0 (12)	20.6 (11)
	Low	38.1 (11)	30.5 (11)

		SIZE	
		High	Low
COLLEGIALITY	High	43.3 (10)	27.7 (13)
	Low	38.6 (13)	22.5 (9)

		INDIVIDUALIZATION	
		High	Low
MORALE	High	34.6 (14)	36.9 (8)
	Low	34.8 (9)	28.9 (14)

		SUPERINTENDENT AUTHORITY	
		High	Low
COLLEGIALITY	High	39.8 (16)	22.5 (7)
	Low	35.8 (7)	30.2 (15)

		AUTONOMY	
		High	Low
COLLEGIALITY	High	28.7 (12)	40.8 (11)
	Low	35.3 (12)	28.0 (10)

Table 5b

Mean Quantity of Change Scores
for Dichotomized Interaction Terms
(N = 45)

INDIVIDUALIZATION

TENSION	High	Low
High	64.5 (9)	49.3 (14)
Low	58.6 (14)	45.2 (8)

AUTONOMY

MORALE	High	Low
High	46.1 (9)	66.5 (13)
Low	56.0 (15)	41.7 (8)

AUTONOMY

COLLEGIALITY	High	Low
High	59.2 (12)	66.9 (11)
Low	45.5 (12)	46.1 (10)

Autonomy/morale: Each of these main terms is negatively correlated to implementation. However, where autonomy is low and morale is high, i.e, where teachers have little influence and they are generally satisfied with this state, implementation is most likely. This combination of morale and actual authority would appear to describe the school with a passive but "satisfied" staff which would be most likely to contribute the extra effort needed to alter existing methods of instruction. Where autonomy is low, and the staff is extremely dissatisfied with the control that they are able to exercise over instructional matters, on the other hand, implementation is low. We may speculate that in such a situation there is insufficient motivation to participate in a system wide change effort.

Superintendent authority/collegiality: This result suggest that where central administrative authority is high and collegiality is high, implementation will be enhanced. Where the school environment is interpersonally supportive and the administration has the ability and position to be able to mandate change there will be few impediments (such as concerns at the teacher level about the infringement of professional rights of teachers) to instituting change. The image created by these interaction variables is one of the "happy family" school, with a relatively strong figure at the helm.

Summary

The objective of this paper has been to investigate the impact of school structure and culture upon the implementation of planned change. In addition to simply locating effective predictors of implementation, we have attempted to contribute to a developing theory of planned school change by examining the relative impact of variables associated with two theoretical perspectives (social psychological and sociological), and hopefully to contribute to a synthesis of the two.

Our findings have indicated that both structure and culture variables are effective predictors of implementation. Each of these two sets has a unique contribution to make to the understanding of change outcomes, although they are differentially effective in predicting two dimensions of change: quality ("how different")and quantity ("how much"). In addition, we have found that there are interactions between the structure and culture of schools which have a significant impact upon the change process.

In short, we would conclude that it is impossible to develop an adequate theory of planned change in schools without paying attention to both significant structure features of the organization, such as patterning of authority, size and teaching technology, and to characteristics of the internal organizational environment, such as collegiality, morale, and tension or conflict.

A final conclusion that may be drawn from this paper concerns the conceptualization of implementation. In constructing our measures of implementation, we initially believed that change was composed of a number of distinct dimensions that should be separately measured in order to ensure that the change was being adequately captured. We did not, however, anticipate that the two dimensions of quantity and quality would require separate analytic procedures in order to adequately explain the outcomes of the planned change program. The finding that quality of change and quantity of change are best predicted by rather different sets of variables adds additional testimony to the need to develop a more sophisticated conceptualization of the outcomes of the change process.

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